Nancy, gives the results of some experiments made on the density of sea water in the course of an inquiry entrusted to him by the commission in connection with the results derived by M. Arctowski.

W. E. P.

ITALIAN CHEMISTRY.

Trattato di Chimica Inorganica Generale e Applicato all' Industria. By Dr. E. Molinari. Pp. xxii+693. (Milan: Ulrico Hoepli, 1905.) Price 12.50 lire.

DURING the greater part of last century the progress of science in Italy was retarded by the political troubles of the country; even after the nation had achieved its independence and unity, scientific education was hampered by ecclesiastical controversies and by the poverty of the newly created Government. Taxation has always fallen heavily on the Italian people, and the industry and energy of the north have been taxed unduly owing to the poverty and thriftlessness of the south. In spite of these disadvantages, Italy gave to science in the last century many names which will long be remembered in its history. In particular, the hypothesis of Count Avogadro, enunciated in 1811, forms the basis of the whole of the modern development of chemistry; for nearly fifty years, however, its importance was overlooked, and it was the peculiar merit of another Italian, Cannizzaro, by reviving it, to establish a new epoch in the development of chemical science and to introduce order where all was confused and contradictory.

In the course of the past twenty-five years a school of Italian chemists has arisen the quality of whose work is on a high level of excellence. Side by side with this, an astonishingly rapid development of all branches of the industry of Italy has occurred. The rapidity of the advance may be gauged from a few facts. In the six years 1893–9, the value of the chemical manufactures of Italy exactly doubled itself, increasing from about 1,000,000*l.* to 2,000,000*l.* per annum. In the twenty-five years from 1875 to 1900 the value of the raw silk annually produced tripled itself, and that of the woven silk, which in 1890 was 600,000*l.*, rose in 1900 to 4,000,000*l.* The cotton and wool industries have developed almost as rapidly, and a similar progress is seen in the case of new manufactures, such as that of steel rails, which have only recently been introduced into the country. In some instances Italian manufacturers have begun to compete in foreign markets, and this development bids fair to become still more rapid as Italy converts more and more of her abundant store of water power into electrical energy.

The author of the present treatise, who holds the position of professor of chemistry at the Society for the Encouragement of Arts and Crafts of Milan, has endeavoured in it to initiate a reform in the teaching of chemistry in Italian universities, a reform which has also been recently urged by Profs. Cannizzaro and Ciamician. Hitherto the chemistry taught has been of too academical a character, little attention being given to practical applications. The title of the present work defines its nature, which is that of a treatise on inorganic chemistry, with especial reference to chemical industry. The commoner elements and their compounds are dealt with in detail, but instead of illustrating the text with time-honoured drawings of lecture apparatus, the actual plant used in the manufacture of these substances is depicted. All the more recent processes of manufacture are described concisely but sufficiently, but the book does not degenerate into a mere treatise of technology. The principal physical and chemical properties of the substances are clearly defined, as well as the relation existing between them; owing to conciseness and to the character of the type employed, a large amount of information is imparted which is not to be found in the usual elementary text-books. A novel feature is that the average market price of each commercial article is stated, whilst statistics are given of the cost of manufacture and profit of many of the more important substances. In many cases the development of an industry is traced through the patents referring to it, for instance, in the case of the manufacture of sulphuric acid and of alkali.

Before undertaking the systematic treatment of the elements, 114 pages are devoted to general chemical theory. It is this part that is most liable to criticism. A portion might very profitably have been omitted. The description, for instance, on pp. 37 to 40, of as many as eight different methods of determining vapour density, serves no useful purpose in a book of this kind, while it is doubtful whether the method of deducing the relationship (pp. 72 to 73) between the osmotic pressure and the freezing and boiling points of dilute solutions will be intelligible to the student in its present form. The historical treatment adopted throughout the work is the cause of a few misstatements which should have been avoided. Why, for instance, revive the story, which has no basis in fact, that Priestley, after languishing in poverty, died of poison? In discussing the history of valency, no mention is made of Frankland and Kolbe, Wurtz and Graham only being referred to. It is, moreover, so far from being the truth (p. 136) that in 1809 Gay-Lussac and Thénard admitted that chlorine was probably an element that even in 1811 they contested Davy's view of its elementary nature. Strangely enough, the part played by Cannizzaro in reviving Avogadro's theory is passed over in silence (p. 33), and the credit given to Gerhardt and Laurent alone.

Dr. Molinari's treatise is especially adapted and is likely to be very serviceable to the student who intends devoting himself to chemical industry; for a similar text-book at an equally low price the English student has long sighed in vain. With a few slight alterations the work could be made equally useful to the engineer. In particular, more space might be given to considering materials of construction, whilst the treatment of alloys is far too brief to be satisfactory, considering the important part which they now play in engineering. Several pages of part i. might well be replaced by a general discussion of the remarkable influence of impurities and of thermal

treatment on the physical properties of metals. The phase rule, which is briefly explained, could be given a practical application by referring to the nature of alloys, particularly in the case of carbon-iron mixtures.

As is the case with all the works published by the well known firm of Ulrico Hoepli, the printing and reproduction of the illustrations leave nothing to be desired. It is, however, a pity that so many proper names are wrongly spelt; thus Graham is uniformly spelt *Grahm*, and Van der Waals *Van der Vaals*. More than ten misprints of other names are observable. W. A. D.

A NEW CRYSTALLOGRAPHY.

Grundzüge der Kristallographie. By Prof. C. M. Viola. Pp. iv+389. (Leipzig: W. Engelmann, 1904.) Price 11 marks; bound, 12 marks.

THE opinion is rapidly gaining ground that the theory of crystallography based on the laws of rational indices and symmetry no longer suffices without modification for the classification and description of crystals. It is recognised on the one hand that isomorphism of kindred substances shows itself (as in the Humite group of minerals) more in similarity of crystalline habit and angles than in identity of optical and geometrical symmetry, and on the other hand that vicinal faces with high indices may play an important part in the economy of crystals. Prof. Viola is evidently of opinion that the old methods cannot be adapted to meet the situation, and his book is as revolutionary as it well could be. Crystals are here divided into 7 sygonies, 10 fundamental forms, and 29 harmonies; symmetry is but a particular case of harmony; twins are two similar crystals with two predominant elements in common; the number of space-lattices is reduced to 10, and of space-groups to 156. The basis of classification is descriptive, not geometrical; blende, felspar, and garnet belong to the same fundamental form, chalcopyrite and tetrahedrite to the same harmony.

If the author had merely attacked the existing theory and advocated a classification expressing the results of direct observation alone, independent of any hypothesis, he might have had some success. Unfortunately, he has tried to build up a mathematical theory of his own, with disastrous results. The average shape of all crystals of a substance grown under approximately the same conditions is its "habit"; the average shape of all habits is its "fundamental form." The rate of growth in any direction is proportional to the "cohesion" in that direction (measured, apparently, by the force needed to break a rod of the substance the length of which lies in the given direction), and cleavage takes place perpendicular to the lines in which minima of cohesion are well marked. It follows that the fundamental form has always a centre of symmetry. These assumptions are hardly justified by the cleavage and usual habit of many crystals, *e.g.* fluorite and tetrahedrite, but the mathematical development of these hypotheses is, if possible, still more unfortunate than the premises themselves. It is argued (p. 14, *cf.* Fig. 20) that if two faces grow outwards with velocities c_1 and c_2, (1) their intersection moves with the velocity c_3, compounded of c_1 and c_2, (2) therefore the face perpendicular to c_3 grows with velocity c_3, (3) c_3 is a maximum or a minimum when c_1 and c_2 are minima. Of these statements (1) and (3) are untrue, and (2) absolutely unproven. Thus the fundamental principles on which nearly the whole of the book is based are wrong. Much of the reasoning is of the same fallacious nature, or is, at best, only an appeal to probability; but one more example must suffice.

The author sets himself (p. 251) the impossible task of proving that a symmetry-axis of a homogeneous medium is 2-al, 3-al, 4-al, or 6-al without employing either the law of rational indices or a molecular structure. He accomplishes this by assuming that if the medium is brought to self-coincidence by a rotation through an angle 2γ about an axis C, it cannot be brought to self-coincidence by a rotation about C through any angle less than 2γ.

Prof. Viola apparently considers the space-lattice as only a convenient geometrical expression of the physical properties of a crystal, not as corresponding to any reality of crystal-structure. It is true that he proves (by assuming that the densities of the molecule and of the crystal as a whole are equal, see pp. 280, 335) that the unit of crystalline structure must be the same as the chemical molecule; but on pp. 322 and 334 he uses arguments which would prove the existence of an infinite number of such units in a finite volume.

Crystallographers owe a debt of gratitude to the author for his clear and complete lists of references to the literature of the various subjects with which he deals; the historical notes are also very valuable. The chapters on the two-circle goniometer and the stereographic projection contain much that is interesting and not in the usual text-books. The appearance of the book is attractive, but there is a large number of misprints, some of which quite obscure the author's meaning. HAROLD HILTON.

OUR BOOK SHELF.

The Arris and Gale Lectures on the Neurology of Vision. By J. Herbert Parsons, B.S., D.Sc., F.R.C.S. Pp. 70. (London: Hodder and Stoughton, 1904.) Price 2*s.* 6*d.* net.

THE two lectures delivered by Mr. Parsons in the spring of last year before the Royal College of Surgeons deal with some points on the neurology of the eye which are of extreme interest. The first lecture has for its subject the course of the afferent impulses from the retina to the central nervous system, and their final distribution in the cerebral cortex. Since the delivery of these lectures there have been several important contributions to this latter subject. The case of Dr. Beevor and Dr. Collier, reported in the summer number of *Brain*, seems to go conclusively against the more restricted visual area for which Henschen argues. In this case, despite the fact that the lingual lobe, the depths of the calcarine fissure, and the lower cuneal lobe were all affected, the restriction of the field of vision was simply quadrantic. The truth seems to be that the limits of the visual cortical area correspond to the limits of the layer of Gennari, and that this varies markedly in its relations to the surface in different cases.

The second lecture deals with an equally important